The cognitive interview for witnesses with autism spectrum disorder

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Abstract

The Cognitive Interview (CI) is one of the most widely accepted forms of interviewing techniques for eliciting the most detailed, yet accurate reports from witnesses. No research, however, has examined its effectiveness with witnesses with autism spectrum disorder (ASD). Twenty-six adults with ASD and 26 matched typical adults viewed a video of an enacted crime, and were then interviewed with either a CI, or a Structured Interview (SI) without the CI mnemonics. Groups did not differ on the quantity or quality of their reports when interviewed with a SI, however, when interviewed with a CI the ASD group was significantly less accurate. Findings indicate that investigative professionals should be cautious in relying on the CI to interview witnesses with ASD.

Key Words: Autism Spectrum Disorder, Cognitive Interview, Eyewitness, Memory, Recall, Structured Interview

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Eyewitness evidence is central to the criminal justice system. In 2007, 1.78 million UK offenders were found guilty or cautioned (UK Ministry of Justice, UK, 2008) and 87% of police officers indicated that eyewitnesses usually or always provided major investigative leads (Kebbell & Milne, 1998). Inaccurate or incomplete testimony can lead to wrongful conviction or acquittal (Huff, Rattner, & Sagarin, 1996) and so reliable interviewing techniques are imperative in eliciting the most detailed yet accurate reports from witnesses. The Cognitive Interview (CI) is now one of the most widely used and accepted forms of interviewing in both the US and the UK (Fisher & Geiselman, 1992; Geiselman, 1984), and is currently taught to all police recruits in the UK (Dando & Milne, 2009). The CI has been shown to elicit detailed, yet accurate, reports from adult witnesses (Davis, McMahon & Greenwood, 2005; Kohnken, Milne, Memon & Bull, 1999), children (Geiselman & Padilla, 1988; Memon, Wark, Bull & Koehnken, 1997), older witnesses (Wright & Holliday, 2007b) and witnesses with learning disabilities (referred to in the US as mental retardation) (Milne, Clare & Bull, 1999). Due to the effectiveness of the CI across these various witness groups, recent UK guidelines have recommended that all 'vulnerable witnesses' be interviewed with this technique (*Achieving best evidence in criminal proceedings: Guidance for vulnerable and intimidated witnesses, including children*. Home-Office, UK, 2002), including witnesses with Autism Spectrum Disorder (ASD), whose patterning of memory strengths and weaknesses may render the CI ineffective.

ASD affects approximately 1% of the UK population (Baird, Simonoff & Pickles et al.,

2006) and is clinically characterised by deficits in reciprocal social interaction and communication in the presence of repetitive and stereotyped patterns of behaviour (American Psychiatric Association, 2000; World Health Organisation, 1993). Although current diagnostic classification systems distinguish between Autistic Disorder, Asperger Disorder and Pervasive Developmental Disorder Not Otherwise Specified (e.g. American Psychiatric Association, 2000) there is little evidence to support this sub-classification and some scientists now argue that the different nomenclatures simply reflect different instances of the same underlying spectrum of conditions (see Bowler, 2007). Nevertheless, this remains an issue of debate that requires further research. Relevant to the current manuscript is the fact that individuals from across the Autism Spectrum exhibit a rather unique pattern of memory strengths and weaknesses (Bowler & Gaigg, 2008; Boucher, Mayes & Bigham, 2008) that may render certain aspects of the CI ineffective. Before discussing this unique memory profile in more detail, we briefly outline what the CI comprises.

The Cognitive Interview (CI) is based on two basic principles of how memory typically operates; that retrieval of an event will be enhanced if the context experienced at recall matches that experienced during encoding (Fisher & Geiselman, 1992; Roediger, Weldon, Challis, & Craik, 1989; Tulving & Thompson, 1973), and that memories are stored as interconnected nodes that provide multiple retrieval routes (Tulving, 1974). On the basis of these principles the CI was constructed to comprise four stages: (a) context reinstatement (CR), (b) imagery-guided questioning (QU), (c) change the order of recall (CO), and (d) change the perspective of recall (CP). In CR witnesses are encouraged to mentally reconstruct

the external (physical) and internal (subjective) states that they experienced during the witnessed event before freely reporting as many details of the event as possible. Recall of trivial or incomplete details is encouraged ('report all' instruction) since important facts may be elicited that co-occurred with seemingly unimportant events (Geiselman, Fisher, Mackinnon, & Holland, 1986). CR is followed by QU in which witnesses are asked open-ended questions based on what they said during their first free-recall attempt. Further details are elicited by asking witnesses to summon and describe mental images of the event, for example focusing on the best image they have of the victim in order to describe their clothing. During CO witnesses are then asked to recall the events in a different order, for example starting with the last thing they witnessed and working backwards in detail until they report the first thing they witnessed. Finally, the witness is asked to recall the event from a different perspective (CP), for example from the perspective of another person or imagining they were positioned in a different location (Fisher & Geiselman, 1992). All four of these mnemonic strategies elicit more detailed descriptions of a recalled event because witnesses are encouraged to access their memory through different routes (e.g. Schank & Abelson, 1977). The effectiveness of this strategy, however, depends on how a person stores a memory in the first-place and a substantial amount of evidence indicates that individuals with ASD may do so rather differently than typical individuals (e.g. Bowler & Gaigg, 2008).

Although individuals with ASD demonstrate relatively unimpaired performance on some memory tasks (Bennetto, Pennington, & Rogers, 1996; Minshew & Goldstein, 1993; Renner, Klinger, & Klinger, 2000) a substantial amount of experimental work suggests that they may experience certain difficulties when trying to recall a

witnessed crime. For example, they demonstrate deficits in the recognition of faces (e.g. Blair, Frith, Smith, Abell, & Cipolotti, 2002), in the episodic recollection of personally experienced events (e.g. Bowler, Gardiner, & Grice, 2000; Bruck, London, Landa, & Goodman, 2007), and in the organisation of information in memory (Bowler, Gardiner, Grice, & Saavalainen, 2000; Bowler, Matthews, & Gardiner, 1997; Tager-Flusberg, 1991). They also sometimes struggle to recall where, when, how or from whom they learnt something (Bowler, Gardiner, & Berthollier, 2004; Bennetto *et al.*, 1996), and both neural and theoretical perspectives suggest that individuals with ASD experience difficulties in binding elements of an experience together in memory (e.g. Bowler et al., 1997; Bowler, Gaigg & Gardiner, 2008; Brock, Brown, Boucher, & Rippon, 2002; Gaigg, Gardiner & Bowler, 2008; Parkin, 1997). Moreover, neural approaches implicating the frontal lobes in the neuropathology of ASD would lead to the prediction that such individuals would have an increased tendency to confabulate (e.g. Bachevalier & Loveland, 2006; Dornburg & McDaniel, 2006; Kopelman, Guinan, & Lewis, 1995; Moscovitch & Melo, 1997; Parkin, 1997; Schacter, Kagan & Leichtman, 1995; Stuss, Alexander, Lieberman, & Levine, 1978; Turner, Cipolotti, Yousry, & Shallice, 2008).

As this brief overview suggests, there are several reasons why one might expect individuals with ASD to experience difficulties in recalling witnessed events. What is less apparent is whether this pattern of difficulties may adversely affect the efficacy of CI techniques with witnesses with ASD. On the one hand, previous evidence suggests that individuals with ASD fare better on tests of memory that provide support for the retrieval of previously learned stimuli (Bowler, et al., 1997). For instance, although individuals with ASD have difficulties spontaneously recalling the

context in which certain words were learnt, their performance is similar to comparison individuals if they can choose their answer from a number of options (Bowler *et al.*, 2004). Similarly, although individuals with ASD may be worse at spontaneously recalling lists of words (e.g. Gaigg et al. 2008), their performance is no worse than that of typical individuals on word-stem completion tests in which typical and ASD individuals have a similar tendency to complete word-fragments with words they saw on a previous list (Gardiner, Bowler & Grice, 2003). Such observations suggest that at least the context reinstatement element of the CI might be similarly effective for ASD and typical witnesses.

There are, however, also reasons why one might expect the CI to be rather ineffective, and perhaps even detrimental to the witness accounts of individuals with ASD. First, it is important to note that the cognitive mnemonics utilised in the CI may qualitatively differ from the kind of retrieval support provided in experimental laboratory tasks such as those just described. Another reason why one might doubt the efficacy of the CI in ASD is that elements of the interview, such as context-reinstatement, assume that memories about details of the event are somehow bound to memories of the context. In other words, reinstatement of the context is thought to provide a direct route to memories of other elements of the event. Given that individuals with ASD seem not to bind elements of an experience in memory as typical individuals do (e.g. Bowler & Gaigg, 2008), context reinstatement might fail to enhance the recall of witnesses with ASD. Similar doubts can be raised about the change-order (CO) and change-perspective (CP) mnemonics. Since individuals with ASD experience impairments in temporal cognition (Boucher, 2001), the CO mnemonic might fail to enhance recall and the memory binding difficulties just

mentioned may also render CP mnemonics ineffective. Indeed, based on the implication of frontal lobe involvement in the pathology underlying ASD (e.g. Bachevalier & Loveland, 2006), one might even speculate that the use of mnemonic strategies may elicit an unusual number of confabulations and inaccurate details in individuals with ASD.

As the above discussion demonstrates, it is far from clear whether investigative police officers should or should not rely on the CI when interviewing witnesses with ASD. Instead of speculating about this issue, we present here the first evaluation of the CI in the context of eyewitness testimonies of individuals with ASD. In this context, the aim of the proposed study was to compare the eyewitness reports of a video recorded crime of adults with and without ASD and to contrast the effectiveness of a SI and CI in this context. Although our study was primarily exploratory in nature, we did formulate the tentative predictions that (a) individuals with ASD would provide less complete but not less accurate eyewitness reports, and that (b) the cognitive mnemonics would lead to an increase in the reporting of incorrect and confabulated details by the ASD witnesses. We also examined whether accuracy differs for individuals with ASD specifically for details that are well-established in existing CI research; that is those pertaining to Persons, Actions, Surroundings or Objects. This is of value from both theoretical and applied perspectives, and based on the social and binding deficits in ASD, we expected that this group might have lower accuracy for details pertaining to Persons and Actions.

Method

Participants

Twenty-six individuals with ASD (18 male, 8 female) and 26 typical individuals (18 male, 8 female) took part in this study. Comparison participants were individually matched to the ASD participants within 7 points of Verbal IQ as measured by the WAIS-R or WAIS-III UK (Wechsler, 1997), and groups did not differ on Performance IQ, Full Scale IQ, or age. Thirteen participants from the ASD group and their individually matched comparison were randomly assigned to either the Cognitive Interview (CI) or Structured Interview (SI) conditions, provided that IQ scores and age were similarly distributed across the two conditions. 2 x 2 ANOVAs (Group x Interview) for chronological age, verbal IQ, performance IQ, and full-scale IQ found no significant main effects or interactions. Table 1 summarises these data.

Individuals with ASD were diagnosed by clinicians using a range of approaches, and a review of records and/or assessment with the Autism Diagnostic Observation Schedule (Lord, Rutter, DiLavore & Risi, 1999) confirmed that all met DSM-IV criteria for ASD excluding the requirement for absence of clinically significant delay or abnormality of language development. Clinical diagnoses were checked against the DSM-IV criteria, and diagnoses were accepted only if explicit information on the criteria were present in the letter of diagnosis. The comparison group was recruited from an existing database via local newspaper advertisements and none had a history of neurological or psychiatric illness. Two of the participants with ASD were taking medication for depression, and one was taking an anticonvulsant. Analysis of the data when these participants were removed did not affect the overall pattern of results reported below. Participants were paid standard university fees for their

participation.

INSERT TABLE 1 ABOUT HERE

Materials

A 50 second video clip produced by Surrey Police for police interviewing training purposes was used as the stimulus. The video clip depicted a drug transaction and stabbing in a car park and was rich in quantifiable information relating to Persons, Actions, Surroundings, and Objects.

Each participant was interviewed for their memory of the video clip with either a Structured Interview (SI) or Cognitive Interview (CI). Both SIs and CIs followed the structure recommended by government to professionals who interview witnesses, including that outlined by the *Achieving best evidence* guidelines (Home Office, 2002). The SI served as a good control condition as it followed an identical structure to the CI and differed only on the additional CI techniques. In order to draw direct comparisons across interview types and in line with Milne et al (1999), all interviews were structured as: rapport and explain aims, free-recall, 'can you remember more?' prompt, questioning, second retrieval attempt, third retrieval attempt, and closure. The CI differed from the SI in use of context reinstatement, instructions to report everything and concentrate hard, reverse order during the second retrieval attempt, and changing the perspective in the third retrieval attempt. These followed the protocols described by Fisher and Geiselman (1992). Interview protocols are given in Appendix A.

The first author (a female in her late 20s) conducted all of the interviews. She attended a police cognitive interview training course run by Surrey Police. Six pilot practice interviews (three SIs and three CIs) were conducted and recordings were checked back to ensure that protocols were being sufficiently followed without bias prior to the study.

Procedure

Participants were tested individually and were naive to the purpose of the study so that they were not primed to remember the video clip knowing they would be tested for recall. They were instructed that they would watch a short clip containing some mild violence and swearing, and would then complete some other unrelated tasks. The video clip was presented on a large projector screen. Each participant was instructed that the researcher was unaware of the contents of the clip and would wait outside the room until the clip had finished. Following presentation of the video clip each participant was taken into a different room (to avoid spontaneous context reinstatement), and completed an unrelated filler task (the Embedded Figures Test: Witkin, Oltman, Raskin & Karp, 1971) lasting around 30 minutes. Both before and after the filler task participants were engaged in conversation with the researcher about events unrelated to the video clip in order to build rapport. They were then interviewed in this second room, with either a SI or CI.

Prior to interviews participants were informed that the purpose of the study was to investigate the best ways that the police and other legal officials might interview

eyewitnesses to get the best reports from them, and were instructed to treat the interview as they would a real-life police interview. At the beginning of the interview the participant was reminded that the researcher had not themselves seen the video clip, and that their task was to describe as accurately as possible what they saw from the beginning of the video clip. They were instructed that if they could not remember certain details not to guess and that it was ok to say that they “don't know” or to correct the interviewer when appropriate.

In the first free recall stage of both interview types participants were asked to describe from the beginning of the video clip what they could remember. In CIs this was preceded by the interviewer spending around ten minutes encouraging the participant to mentally reinstate the context (see Appendix B), in addition to the instruction to “report all” and “concentrate hard”. In all interviews free recall was uninterrupted by the interviewer until the participant had finished speaking and was waiting for the next instruction, at which point they were asked if they could remember anything else (“remember more” prompt).

Following best interviewing recommendations (e.g. Home Office, 2002) in the questioning phase participants were asked primarily open questions based on what they had said in the free recall phase (e.g. can you tell me anything more about the girl”); closed questions were kept to a minimum and leading and misleading questions were avoided. Where participants had previously referred to them in the free recall phase, questions probed for more details relating to the people involved (Persons), what they did (Actions), where they were (Surroundings), and what objects were present, including cars or packages (Objects), with the aim of both

interview types to elicit as much information as possible from the participant. In CIs questioning was imagery-guided and participants were encouraged to activate and probe images of the events in question (e.g. “you said that there was a well-built man. Please can you focus really hard on that image you have of him. When you have a clear image please can you describe him to me?”). In the third and fourth stages of SIs participants were asked to again freely recall what they saw happen from the beginning of the clip. In the third (reverse order) stage of CIs participants were asked what the last thing they saw happen was, and then in as much detail as possible what happened just before that, working backwards until they reported the first thing that they saw happen. In the fourth (change perspective) stage of CIs participants were asked to recall again in as much detail as possible what they saw happen, but this time to imagine that the video had been filmed from above and to recall as if they were looking down on the same events from a birds-eye perspective.

Interview coding

All interviews were audio-recorded, transcribed, and scored against the original transcript of the video clip using a technique developed by Memon et al (1997). The video was transcribed for each unit of detail that occurred. Any details reported by participants that did not figure in the original transcript but were confirmed as present in the video were added to transcription of the clip to provide an exhaustive list of details. The final video clip transcription contained 419 units of information, and each of these details was coded according to whether it related to a Person (177), Action (116), Surrounding (44), or Object (82).

Each detail reported by the participant was coded against the transcript of the video clip as either correct if it was present in the video, incorrect if it was inconsistent with the video (e.g. “the girl was wearing a red hat” when it was actually white), or confabulated if it was not present in the video (e.g. “another car drove up”). One point was given for each unit of information provided by participants, for example “the Man with long hair (P) had the package (O) in his right hand (A) and ran away from the stockier man (A) with the girl (P)” would be coded as 5 correct points: 2 Person correct, 2 Action correct, and 1 Object Correct. Subjective statements of opinion (e.g. “he looked a bit shifty”) were ignored. Details were only scored the first time that they were reported and were classified according to which interview stage they were reported in. Accuracy scores were also calculated by dividing the number of correct details reported by the total number of details reported (i.e. correct + incorrect + confabulated). A second independent rater scored 12 randomly selected interview transcripts (3 in each group x condition) against the video clip transcription and the resulting Person’s correlations of the two coders’ scores were: $r_{correct} = 0.93$, $p < 0.0001$, $r_{incorrect} = 0.92$, $p < 0.0001$, $r_{confabulated} = 0.88$, $p < 0.0001$.

Statistical analyses

Initially, we examined the data for distribution of normality and outliers. One ASD participant was identified as an outlier due to a high rate of confabulations and low accuracy. Analyses were carried out with and without this participant and findings changed only marginally. For this reason, in line with the diversity inherent in ASD,

this participant was included in the analyses. Analyses examined recall in relation to correct, incorrect, and confabulated details, and accuracy scores. Analyses also examined whether these details related to Persons, Actions, Surroundings, and Objects, and at which interview stage they were recalled between groups and interview types. Interaction effects were explored by means of 2x2 (group x interview) and 2x4 (within interview type: group x interview stage, and group x detail type) factorial ANOVAs, and follow-up *t*-tests were used to test simple effects. Estimates of effect size, Cohen's *d*, are reported.

Results

In the following analyses there are three major comparisons: across interviews ignoring groups; across groups ignoring interviews; and between groups but within interviews. Findings are reported according to which of these comparisons is being made.

1. Interview duration and number of questions asked

In order to account for any differences that might arise from a difference in the number of questions asked during the questioning phase a two-way ANOVA was conducted with interview and group as fixed factors. There was no difference in the number of questions asked between groups, F (1, 48) = 1.29, p = 0.26, or interviews, F (1, 48) = 0.75, p = 0.39.

Interview duration was measured from the start of witnesses' first free recall and

excluded instructions and cognitive components of CIs. A two-way ANOVA revealed a significant difference in interview duration between interviews F (1, 48) = 21.89, p < 0.0001. In line with previous findings, CIs were significantly longer (M = 21.69 mins, SD = 7.47) than SIs (M = 13.35, SD = 5.38), which could be attributed to witnesses in the CI taking longer to respond and providing more information; this is not surprising given that the aim of the CI is to elicit more information. There were, however, no differences in interview duration between groups, F (1, 48) = 2.90, p = 0.10, suggesting any between group differences in recall were not related to interview duration.[1]

2. Did the ASD group differ from controls and was this based on interview type?

A 2 x 2 (group x interview) ANOVA revealed no significant main effects of group for correct, F (1, 48) = 2.26, p = 0.13, Cohen's d = 0.41, incorrect, F (1, 48) = 1.76, p = 0.19, Cohen's d = 0.37, or confabulated, F (1, 48) = 1.02, p = 0.32, Cohen's d = 0.28, details overall. There was however a significant main effect of group for accuracy, F (1, 48) = 5.24, p < 0.05, Cohen's d = 0.63; overall the ASD group were significantly less accurate (Mean = 0.83, SD = 0.09) than were the control group (Mean = 0.87, SD = 0.07).

There was also a main effect of interview type. CIs elicited significantly more correct details (Mean = 95.35, SD = 35.54) than SIs did (Mean = 71.08, SD = 18.69), F (1, 48) = 10.09, p < 0.005, Cohen's d = 0.88, without eliciting significantly more incorrect, F (1, 48) =1.90, p = 0.18, Cohen's d = 0.38, or confabulated details, F (1,

48) = 0.83, p = 0.37, Cohen's d = 0.25, or a reduction in accuracy, F (1, 48) = 0.06, p = 0.82, Cohen's d = 0.07.

There were no group x interview interactions for correct, F (1, 48) = 2.74, p = 0.10, or confabulated details, F (1, 48) = 1.68, p = 0.20. There were significant group x interview interactions for incorrect details, F (1, 48) = 4.11, $p < 0.05$, and accuracy scores, F (1, 48) = 7.33, $p < 0.05$. Follow-up t-tests revealed that when interviewed with CIs, the ASD group reported significantly more incorrect details (Mean = 15.62, SD = 7.19) than did the control group (Mean = 10.46, SD = 3.82), t (24) = 2.28, $p < 0.05$, Cohen's d = 0.89. The ASD group were also significantly less accurate (Mean = 0.80, SD = 0.09) than were the control group (Mean = 0.90, SD = 0.05), t (24) = 3.55, $p < 0.005$, Cohen's d = 1.39, when interviewed with CIs. Moreover, whilst the control group recalled significantly more correct details with CIs compared to SIs, t (24) = 5.19, $p< 0.0001$, Cohen's d = 2.04, there was no such increase in reporting of correct details between interview types for the ASD group, t (18) = 0.86, p= 0.40, Cohen's d = 0.34. In fact, the ASD group reported significantly more incorrect details in the CI compared to the SI, t (24) = 2.21, $p < 0.05$, Cohen's d = 0.87 (see Table 2).

When interviewed with SIs, there were no significant differences between groups for correct, t (24) = 0.12, p = 0.90, Cohen's d = 0.05, incorrect, t (24) = 0.52, p = 0.61, Cohen's d = 0.20, or confabulated details, t (24) =0.28, p = 0.78, Cohen's d = 0.11, or in accuracy scores, t (24) = 0.30, p = 0.77, Cohen's d = 0.12.

INSERT TABLE 2

In order to clarify where the problem lies for the ASD group with the CI, we ran two additional analyses; firstly to look at the types of details that were reported, and secondly to examine whether groups differed between stages of the CI. The main group differences reported earlier were between accuracy and incorrect details. Given that these two types of details are not independent from one another, and accuracy is a more sensitive measure which takes into account incorrect details and confabulations, further analyses were conducted for accuracy scores only.

Accuracy scores were calculated for Person, Action, Surrounding and Object details respectively. A 2 (group) x 2 (interview) x 4 (detail type) ANOVA revealed a significant group x detail type interaction for accuracy, F (3, 144) = 6.69, $p < 0.001$. There was no interview x detail type interaction, F (3, 144) = 1.41, $p = 0.24$, or group x interview x detail type interaction, F (3, 144) = 0.23, $p= 0.87$. In-line with findings reported earlier there was a significant group x interview interaction, F (1, 48) = 8.91, $p< 0.005$. Follow-up t-tests showed significant between group differences for accuracy for Person details, t (18) = 3.51, $p < 0.005$, Cohen's d = 1.35, and Action details, t (14) = 3.66, $p < 0.005$, Cohen's d = 1.46. Within the control group, there was also a significant difference between interviews for surrounding details, t (24) = 2.22, $p < 0.05$, Cohen's d = 0.87 and within SIs there was a significant difference between groups for surrounding details, t (20) = 2.79, $p < 0.05$, Cohen's d = 1.09 (see Table 3).

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INSERT TABLE 3

Group differences for accuracy between stages of the CI were examined. A 2

(group) x 2 (interview) x 4 (interview stage) ANOVA did not reveal significant group x stage, F (2, 141) = 0.52, p = 0.67, interview x stage, F (2, 141) = 0.90, p = 0.42, or group x interview x stage interactions, F (2, 141) = 0.57, p = 0.59 (see Table 4). Thus the different stages did not affect the ASD and control groups differentially. Again there was a group x interview interaction for accuracy, F (1, 47) = 5.94, $p < 0.05$.

INSERT TABLE 4

Discussion

This is the first study to investigate the CI for use with ASD individuals. The findings show that people with ASD are as accurate and provide as detailed eyewitness reports as do typical individuals when interviewed with a SI. However, not only does the CI fail to increase the number of correct details reported by individuals with ASD, as is the case for typical individuals, when interviewed with a CI, they report significantly more incorrect details, and are consequently significantly less accurate than their typical counterparts. These findings undoubtedly indicate that investigative professionals should be cautious in relying on the CI to interview witnesses with ASDs.

Compared to typical individuals, individuals with ASD reported significantly more incorrect details which in turn made them significantly less accurate when interviewed with a CI. That these incorrect details pertained to Persons and Actions is not surprising given that ASD is characterised by interpersonal difficulties coupled

with difficulties with agent-centred second order representations which are fundamental to understanding actions and actors' intentions over time (e.g. Baron-Cohen, Leslie, & Frith, 1985; Leslie, 1987). The lower accuracy scores for Person details reported by the ASD group are also not surprising considering the social impairments that characterise ASDs, in addition to difficulties in domains such as face processing (Blair et al., 2002) and gaze perception (e.g. Ashwin, Ricciardelli, & Baron-Cohen, 2009). Indeed previous work using eye-tracking techniques has indicated that ASD individuals spend less time than do typical individuals viewing people and faces in social situations (Mercadante, Macedo, Baptista, Paula, & Schwartzman, 2006; Riby & Hancock, 2009; Riby & Hancock, 2008), and future work would be valuable in utilising these eye tracking techniques to examine the role of directed attention on salient social and person aspects of an event and its effect on subsequent memory recall in an eyewitness paradigm. That the ASD group were significantly more accurate for Surrounding details when interviewed with SIs is not unexpected given that these types of details can be relatively separated from person and action details and might rely on more of a rote memory strategy. The control group were significantly more accurate for Surrounding details in CIs compared to SIs, and this again is more of an artefact of the way that the two interviews operate; in the CI, particularly the change perspective stage, witnesses are encouraged to think about these types of detail. Moreover, if ASD witnesses have difficulty with the CI mnemonics, it follows that this interview type will not lead to an increase in accuracy for surrounding details, as is the case for typical individuals.

Findings that the ASD group were significantly less accurate than their typical counterparts at a similar rate on all stages of the CI is also unsurprising given

previous work indicating relational processing difficulties in ASD (Bowler & Gaigg, 2008). This account argues that representations of elements of complex events are not marked in a way that enables subsequent retrieval of these elements as an integrated whole. In this context, our findings suggest that the task support hypothesis (Bowler et al., 2004) is useful only up to a point; support is beneficial if clues to the content of the recalled material are provided at test. When clues to the memory process are provided, as in the CI, then overall accuracy is compromised. It is possible that individuals with ASD either do not encode, store, or have difficulty retrieving contextual information surrounding an event in the same way as typical individuals, or that these contextual details are not bound with their memory for details of the event itself; if there is looser item-context binding, then CR would naturally be a less effective cue. Moreover, when asked to mentally reinstate the context and then report the event, not only does CR fail to increase the amount of correct details reported, it also decreases their accuracy by confounding their original memory leading them to go on to erroneously report incorrect details. This was found despite an explicit warning to only report accurate information and not to guess or fabricate, and may have been further exacerbated by the 'report all' instruction which emphasises quantity, even if seemingly minor, insignificant or partial. Another possible explanation for these findings relates to the degree to which the crime stimulus was emotionally-arousing. Empirical work has demonstrated that whilst typical individuals show reduced forgetting rates for arousing stimuli, this is not so for individuals with ASD (Gaigg & Bowler, 2008). Thus, if emotionally arousing events are forgotten at a higher rate for ASD individuals than is the case for typical individuals, the comparison group would have had a stronger trace on which to base context reinstatement and retrieval in the CI compared to the ASD group. This might

explain the between group differences that were present for CIs but not SIs, and future research that controls for the effect of emotionally arousing stimuli would be fruitful in providing a deeper examination into why and how the CI leads to ASD witnesses becoming less accurate than their typical counterparts. Either way, CR appears to present a real problem for witnesses with ASD, as does the 'activate and probe an image' questioning stage, most likely due to the imagery-guided style of questioning which are like a series of mini context reinstatements. Difficulties with the CO stage for the ASD group were also expected considering previous work which has demonstrated diminished temporal order memory in ASD (Bennetto *et al.*, 1996), as was the CP stage; individuals with ASD are known to have difficulties adopting a frame of reference other than their own and have difficulties on spatial working memory tasks (Minshew et al., 1999; Morris, Rowe, Fox, *et al.*, 1999; Williams, Goldstein, Carpenter & Minshew, 2005; Williams, Goldstein & Minshew, 2006). These findings warrant further clarification in furture research, from both an applied and also a theoretical perspective.

We acknowledge limitiations in the present study; our sample was limited to individuals with ASD who had normal or above normal intellectual functioning; future research would be well placed to examine this with individuals who have developmental delays, or those with co-morbid disorders. The possibility of a floor effect operating for some of the confabulated details is also acknowledged, which makes any conclusions regarding no between group differences for the confabulated data somewhat tentative. Furthermore, coding (which was in-line with previous research, e.g. Memon et al., 1997) did not distinguish between major errors (e.g. the sex of the perpetrator) and minor errors (e.g. the colour of the fence in the

background) made by participants, nor the types of correct and incorrect details given in terms of whether they were central or peripheral to the crime or whether they were at the gist or verbatim level. Despite these limitations, our findings strongly suggest that the CI should not be used to interview witnesses with ASD; in real life the reconstruction of an event based on the testimony of an individual with ASD interviewed with the CI is likely to be highly inaccurate. Findings highlight a need for further research to examine this in more detail, in addition to an exploration of what the best and most appropriate interviewing strategies for individuals with ASD would be in order to obtain the most forensically relevant information. On a positive note, that the ASD group did not differ from typical individuals when interviewed with a SI is encouraging, and suggests that when interviewed appropriately, are just as valuable as witnesses as are typical individuals.

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Appendix A. Structured and Cognitive Interview protocols

Italics = Cognitive Interviews only

- Rapport and explain aims
    - Reiterate that interviewer blind to contents of video
    - Explain that participant will be asked to go over events a few times; motivate to repeatedly recall
    - Don't guess; ok to say “don't know”
    - ‘*Report all’ (no matter how trivial)*
    - *Concentrate hard*
    - Transfer control
    - Any questions

- **Stage 1:**
    - *Context reinstatement:*
    - Free recall

- ‘Remember more’ prompt

- **Stage 2:** Questioning
    - *Activate and probe an image*
    - Open questions based on what participant said in free recall

- Witness-compatible wording (e.g. if they use the term ‘guy’ then interviewer asks about the ‘guy’ rather than the man
- Minimal closed questions for follow-up details
- No leading questions
- Don't guess; ok to say “don't know”

- **Stage 3:** Second retrieval attempt/ *reverse order*

- **Stage 4:** Third retrieval attempt/ *change perspective*

- Closure

Appendix B: Context Reinstatement protocol

What we are going to do is called context reinstatement, where you remember other things that you saw and felt just before you watched the video clip. This will help you to remember better.

In a few minutes I am going to ask you to tell me everything that you can remember.

In order for you to recall to the best of your memory I would like to you contextually remember the environment just before you saw the events unfold – what you could see, hear, sense, how you felt – and use this information to guide your recall.

I will go through this very slowly, so that you can relax and take it all in in order to build up a clear picture in your mind. This will take several minutes before you speak to build up a really clear picture of the clip in your mind. Please try to relax, concentrate and focus really hard with each instruction that I give. Although this might seem like a series of questions I don't want you to answer them, they are just there so that you can build up a clear picture in your mind. At the end I will ask you to tell me what happened, not now, so in the meantime try to relax and take it all in.

If you close your eyes it will help you to focus, I will just look down here.

I would like you to clear your head of all other thoughts. Try to blank everything else from your mind, and focus only this task [5secs]

Think about how you were feeling when you came in here today [10secs]

Now picture yourself as you went into in the room where you watched the video [10secs].

Focus on that room [10secs]

Remember where you were sitting [5secs] *and how the chair felt* [5secs]

Think about the lights [5secs] *and noises* [10secs] *in the room just before the video started* [10secs]

Remember your mood when you started watching the video [5secs]*. How were you feeling?* [5secs].

How was your physical state? [5secs]

Now picture the screen ahead of you [10secs]

Build up a clear mental picture of that moment and visualise it [10secs].

Remember what the colours in the video were like [5secs].

Think about the noises you heard in the video [10secs]

Visualise where the event is taking place and what the scene or environment around looks like. Take in these surroundings and mentally note everything that you see [10secs]

Visualise what people are involved, what they look like, what they are wearing, what they are doing and how they are behaving [10secs]

Think about everything that you saw, noting every single detail, no matter how small or irrelevant it may seem, even if it seems trivial [10secs]

Back in this context you should be able to see the videotape in your mind. Picture the events you saw in the video as if they were happening right now before your eyes [10secs]

I'd like you to keep picturing and remembering what you saw. When you are ready please explain to me, in every detail, what you saw from the beginning of the videotape to the end – as you tell me keep your eyes closed and concentrate and focus on that image in your mind. Don't leave anything out, even if it seems only partial or not significant. Take your time.

As you run through what happened, try to replay the event in your head, as if it were a video that is replaying before you, which you are watching right now.

When you are ready, please tell me everything you saw

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Footnotes

[1]Although previous studies (e.g. Wright & Holliday, 2007a; b) have used interview duration as a covariate in analyses, it was deemed that this would have provided a somewhat circular argument for findings in the present study; if witnesses spent more time talking they would naturally come up with more detail.

Table 1

Age and IQ scores for the ASD and comparison groups, within each interview condition (standard deviations in parentheses)

	ASD (N = 26)	**Controls (N= 26)**
Cognitive	(n = 13)	(n = 13)
Interview (N = 26)		
Age (years)	37.08 (10.97)	44.62 (9.18)
VIQ[a]	109.23 (10.90)	112.08 (13.56)
PIQ[b]	108.23 (16.62)	107.38 (15.00)
FIQ[c]	109.54 (13.29)	110.85 (14.92)
Structured	(n = 13)	(n = 13)
Interview (N = 26)		
Age (years)	40.54 (13.85)	37.92 (14.08)
VIQ	113.23 (15.43)	112.12 (14.61)
PIQ	110.08 (15.16)	110.77 (15.05)
FIQ	113.23 (16.75)	112.46 (16.61)

a Verbal IQ (WAIS-R UK or WAIS-III UK); b Performance IQ (WAIS-R UK or WAIS-III UK); c Full-scale IQ (WAIS-R UK or WAIS-III UK)

Table 2.

Mean number of correct, incorrect and confabulated details, and accuracy scores for ASD and control groups within Structured and Cognitive Interviews (standard deviations are in parentheses)

	Cognitive Interview				**Structured Interview**			
	Correct	Incorrect	Confab	Accuracy	Correct	Incorrect	Confab	Accuracy
ASD	83.15	15.62[bd]	3.00	0.80[a]	71.54	10.38[d]	1.23	0.86
	(43.32)	(7.19)	(4.71)	(0.09)	(22.43)	(4.61)	(2.45)	(0.07)
Control	107.54[c]	10.46[b]	1.15	0.90[a]	70.62[c]	11.46	1.46	0.85
	(20.81)	(3.82)	(1.52)	(0.05)	(14.97)	(5.92)	(1.71)	(0.77)

[a] significant between group difference $p < 0.005$;
[b] significant between group difference $p < 0.05$
[c] significant between interview difference $p < 0.005$
[d] significant between interview difference $p < 0.05$

Table 3.

Mean accuracy scores for ASD and control groups within Structured and Cognitive Interviews for Person, Action, Surrounding and Object details (standard deviations are in parentheses)

	Cognitive Interview				**Structured Interview**			
	Person	Action	Surround	Object	Person	Action	Surround	Object
ASD	0.74[a]	0.80[a]	0.95	0.82	0.81	0.89	0.96[b]	0.87
	(0.11)	(0.14)	(0.07)	(0.09)	(0.08)	(0.09)	(0.07)	(0.14)
Control	0.86[a]	0.95[a]	0.94[c]	0.88	0.81	0.91	0.86[bc]	0.86
	(0.58)	(0.39)	(0.75)	(0.95)	(0.12)	(0.10)	(0.12)	(0.11)

[a] significant between group difference $p < 0.005$
[b] significant between group difference $p < 0.05$
[c] significant between interview difference $p < 0.05$

Table 4.

Mean accuracy scores for ASD and control groups within Structured and Cognitive Interviews for interview stages 1, 2, 3 and 4 (standard deviations are in parentheses)

	Cognitive Interview				**Structured Interview**			
	1 CR	2 QU	3 CO	4 CP	1 Free recall	2 QU	3 Recall 2	4 Recall 3
ASD	0.89[ab] (0.09)	0.71[ab] (0.10)	0.71 (0.30)	0.72[ab] (0.27)	0.95[b] (0.05)	0.79[b] (0.09)	0.89 (0.16)	0.89[b] (0.16)
Control	0.95[a] (0.03)	0.82[a] (0.09)	0.88 (0.19)	0.89[a] (0.17)	0.93 (0.07)	0.79 (0.10)	0.88 (0.16)	0.86 (0.21)

[a] significant between group difference $p < 0.05$
[b] significant between interview difference $p < 0.05$